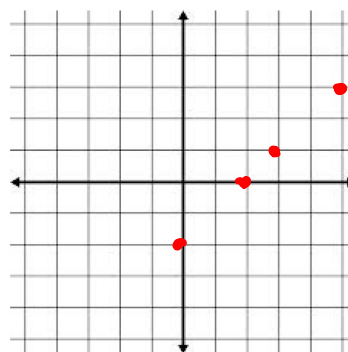
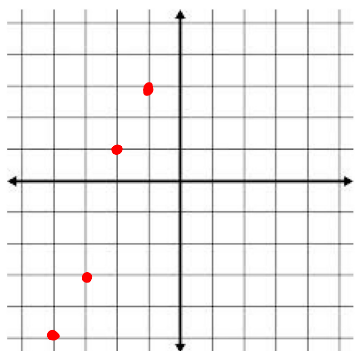


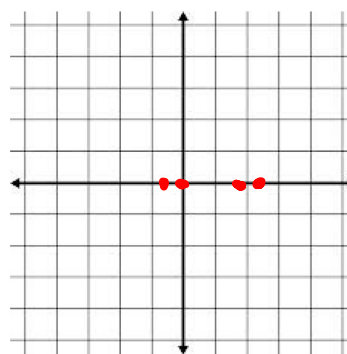
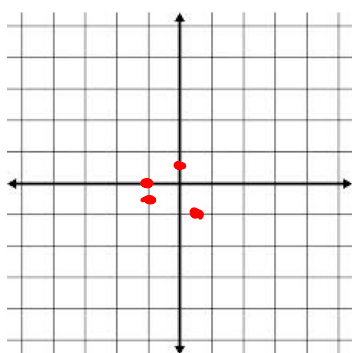
Graph each relation.

1. $\{(-1, 3), (-2, 1), (-3, -3), (-4, -5)\}$ 2. $\{(0, -2), (2, 0), (3, 1), (5, 3)\}$



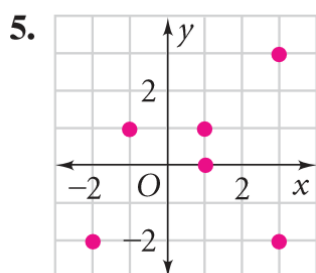
Sep 26-7:42 AM

3. $\left\{(-1, 0), \left(\frac{1}{2}, -1\right), \left(0, \frac{1}{2}\right), \left(-1, -\frac{1}{2}\right)\right\}$ 4. $\left\{\left(2\frac{1}{2}, 0\right), \left(-\frac{1}{2}, 0\right), (2, 0), (0, 0)\right\}$

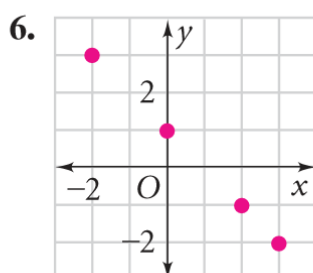


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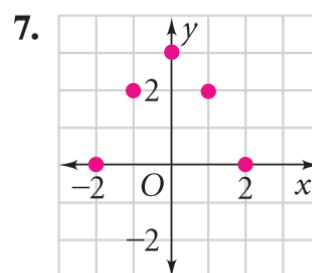
Write the ordered pairs for each relation. Find the domain and range.



$(-2, -2)$
 $(-1, 1)$
 $(1, 0)$
 $(1, 1)$
 $(3, -2)$
 $(3, 3)$
 $D: \{-2, -1, 1, 3\}$
 $R: \{-2, 0, 1, 3\}$



$(-2, 3)$
 $(0, 1)$
 $(2, -1)$
 $(3, -2)$
 $D: \{-2, 0, 2, 3\}$
 $R: \{3, 1, -1, 2\}$



$(-2, 0)$
 $(-1, 2)$
 $(0, 3)$
 $(1, 2)$
 $(2, 0)$
 $D: \{-2, -1, 0, 1, 2\}$
 $R: \{0, 2, 3\}$

Sep 26-7:45 AM

Determine whether each relation is a function.

12. $\{(1, -2), (-2, 0), (-1, 2), (1, 3)\}$ **NO**

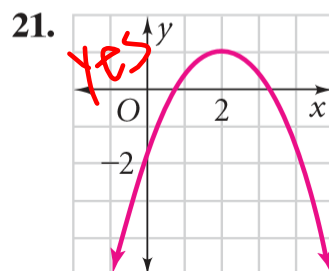
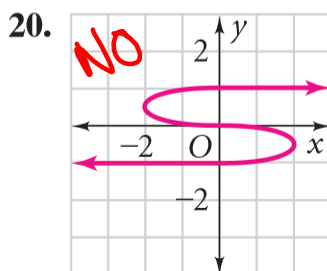
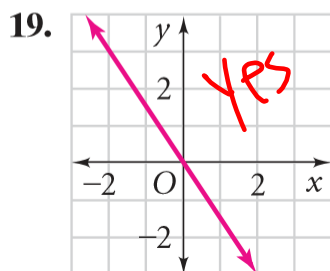
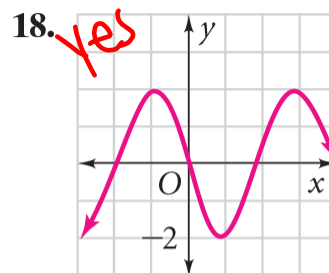
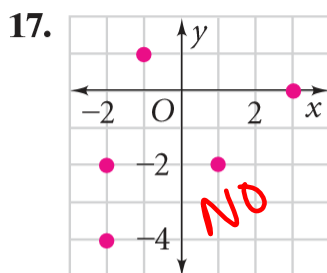
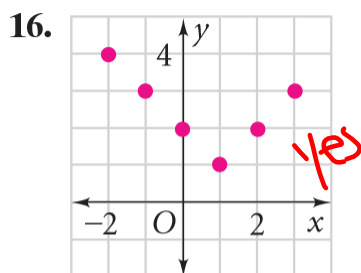
13. $\{(1, 1), (2, 2), (3, 5), (4, 10), (5, 15)\}$ **yes**

14. $\left\{\left(17, \frac{15}{4}\right), \left(\frac{15}{4}, 17\right), \left(15, \frac{17}{4}\right), \left(\frac{17}{4}, 15\right)\right\}$ **yes**

15. $\left\{\left(-3, \frac{2}{5}\right), \left(-2, \frac{3}{5}\right), \left(\frac{3}{2}, -5\right), \left(5, \frac{2}{5}\right)\right\}$ **yes**

Sep 26-7:46 AM

Use the vertical-line test to determine whether each graph represents a function.



Sep 26-7:46 AM

For each function, find $f(-5)$, $f(-3)$, $f(\frac{1}{2})$, and $f(4)$.

22. $f(a) = 2a + 3$

$$f(-5) = 2(-5) + 3$$

$$= -7$$

$$f(-3) = 2(-3) + 3$$

$$f(\frac{1}{2}) = 2(\frac{1}{2}) + 3$$

$$= 4$$

$$f(4) = 2(4) + 3$$

$$= 11$$

23. $f(y) = -3y - 2$

$$f(-5) = 13$$

$$f(-3) = 7$$

$$f(\frac{1}{2}) = -\frac{7}{2}$$

$$f(4) = -14$$

24. $f(z) = z + 9.5$

$$f(-5) = 4.5$$

$$f(-3) = 6.5$$

$$f(\frac{1}{2}) = 10$$

$$f(4) = 13.5$$

Sep 26-7:46 AM

25. $f(x) = -x - 7$

$f(-5) = -2$

$f(-3) = 4$

$f(\frac{1}{2}) = -7.5$

$f(4) = -11$

26. $f(d) = 1 - 4d$

$f(-5) = 21$

$f(-3) = 13$

$f(\frac{1}{2}) = -1$

$f(4) = -15$

27. $f(x) = 2x - 3$

$f(-5) = -13$

$f(-3) = -9$

$f(\frac{1}{2}) = -2$

$f(4) = 5$

Sep 26-7:46 AM

28. $f(h) = -6h - \frac{2}{3}$

$f(-5) = \frac{88}{3}$

$f(-3) = \frac{52}{3}$

$f(\frac{1}{2}) = -\frac{11}{3}$

$f(4) = -\frac{74}{3}$

29. $f(x) = \frac{5}{6}x + \frac{1}{3}$

$f(-5) = -\frac{23}{6}$

$f(-3) = -\frac{13}{6}$

$f(\frac{1}{2}) = \frac{3}{4}$

$f(4) = \frac{11}{3}$

30. $f(t) = \frac{1}{2}t - 2$

$f(-5) = -4.5$

$f(-3) = -3.5$

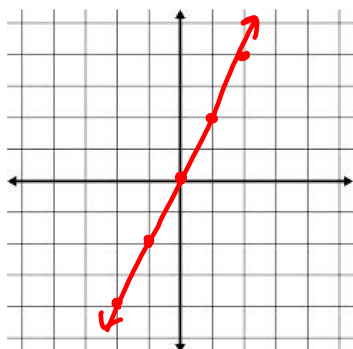
$f(\frac{1}{2}) = -1.75$

$f(4) = 0$

Sep 26-7:46 AM

Graph each equation. Check your work.

1. $y = 2x$

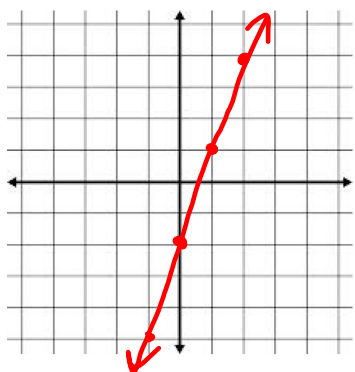


2. $y = -3x - 1$



Sep 26-7:47 AM

3. $y = 3x - 2$

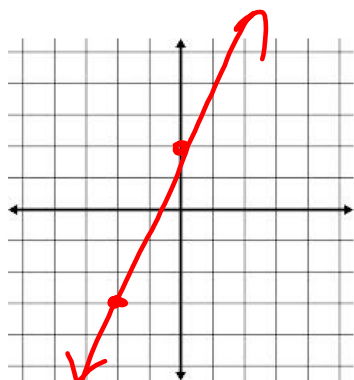


4. $y = -4x + 5$

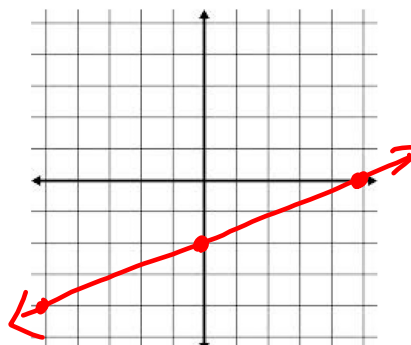


Sep 26-7:47 AM

5. $5x - 2y = -4$

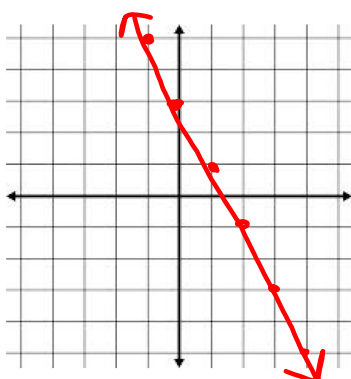


6. $-2x + 5y = -10$

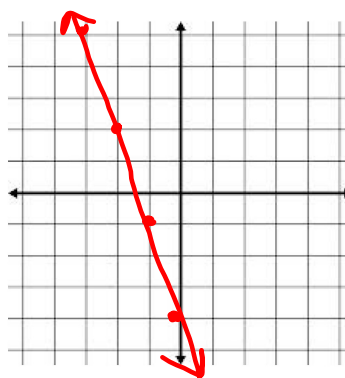


Sep 26-7:47 AM

7. $y - 3 = -2x$



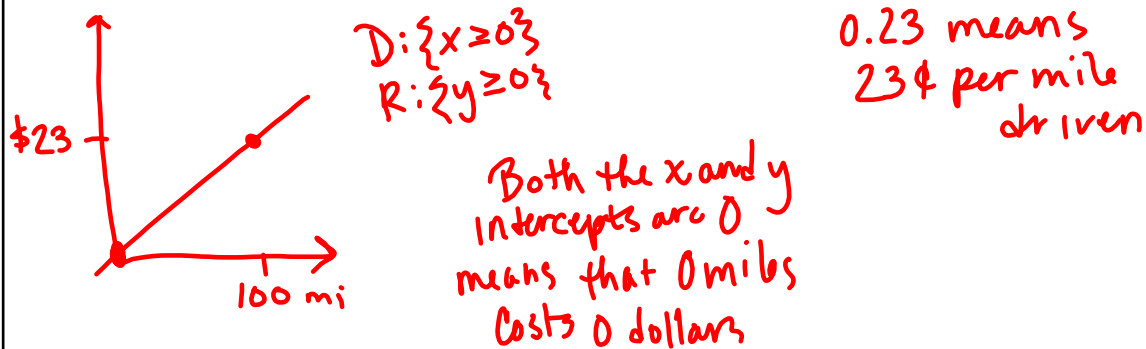
8. $y + 4 = -3x$



Sep 26-7:48 AM

9. **Cost Analysis** The equation $y - 0.23x = 0$ relates the cost of operating a car to the number of miles driven, where x is the number of miles driven and y is the cost.

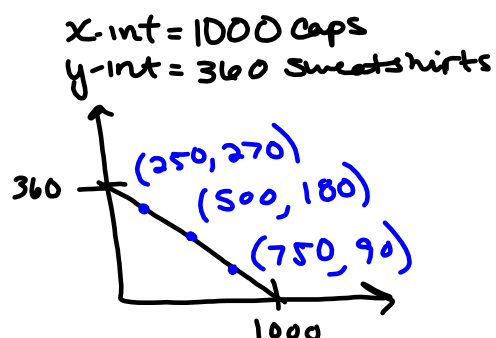
- Graph the equation and determine the domain and range.
- Explain what the x - and y -intercepts represent.
- Explain what 0.23 represents.



Sep 26-7:48 AM

10. **Fund-Raising** The school glee club needs a total of \$4500 for a trip to Omaha, Nebraska. To make money, members are selling baseball caps for \$4.50 and sweatshirts for \$12.50.

- Graph the equation $4.5x + 12.5y = 4500$, where x is the number of baseball caps and y is the number of sweatshirts sold.
- Explain the meaning of the x - and y -intercepts in terms of the fund-raising.



the intercepts represent how many you would have to sell of each if you were only selling one item.

Sep 26-7:48 AM

Find the slope of the line through each pair of points.

11. (1, 6) and (8, -1)

$$\frac{6 - (-1)}{1 - 8} = \frac{7}{-7} = -1$$

12. (-3, 9) and (0, 3)

$$\frac{9 - 3}{-3 - 0} = \frac{6}{-3} = -2$$

13. (0, 0) and (2, 6)

$$\frac{6 - 0}{2 - 0} = \frac{6}{2} = 3$$

Sep 26-7:48 AM

14. (-4, -3) and (7, 1)

$$\frac{1 - (-3)}{7 - (-4)} = \frac{4}{11}$$

15. (-2, -1) and (8, -3)

$$\frac{-3 - (-1)}{8 - (-2)} = \frac{-2}{10} = -\frac{1}{5}$$

16. (1, 2) and (2, 3)

$$\frac{3 - 2}{2 - 1} = \frac{1}{1} = 1$$

Sep 26-7:48 AM

17. $\left(\frac{2}{3}, \frac{4}{7}\right)$ and $\left(\frac{2}{3}, \frac{11}{7}\right)$

18. $(-3, 5)$ and $(4, 5)$

19. $(-5, -7)$ and $(0, 10)$

$$\frac{\frac{11}{7} - \frac{4}{7}}{\frac{2}{3} - \frac{2}{3}} = \frac{\frac{7}{7}}{0}$$

$$= \text{undefined}$$

$$\frac{5 - 5}{4 - -3} = \frac{0}{7}$$

$$= 0$$

$$\frac{10 - -7}{0 - -5} = \frac{17}{5}$$

Sep 26-7:48 AM

Write in point-slope form the equation of the line through each pair of points.

26. $(-10, 3)$ and $(-2, -5)$

27. $(1, 0)$ and $(5, 5)$

28. $(-4, 10)$ and $(-6, 15)$

$$m = -\frac{8}{8} = -1$$

$$m = \frac{5}{4}$$

$$m = \frac{5}{-2} = -\frac{5}{2}$$

$$y - 3 = -1(x + 10)$$

$$y - 0 = \frac{5}{4}(x - 1)$$

or

$$y - 10 = -\frac{5}{2}(x + 4)$$

$$y + 5 = -1(x + 2)$$

$$y - 5 = \frac{5}{4}(x - 5)$$

$$y - 15 = -\frac{5}{2}(x + 6)$$

Sep 26-7:48 AM

29. $(0, -1)$ and $(3, -5)$

$$m = -\frac{4}{3}$$

$$y + 1 = -\frac{4}{3}(x - 0)$$

$$\text{or } y + 5 = -\frac{4}{3}(x - 3)$$

30. $(7, 11)$ and $(13, 17)$

$$m = \frac{6}{6} = 1$$

$$y - 11 = 1(x - 7)$$

$$\text{or } y - 17 = 1(x - 13)$$

31. $(1, 9)$ and $(6, 2)$

$$m = -\frac{7}{5}$$

$$y - 9 = -\frac{7}{5}(x - 1)$$

$$\text{or } y - 2 = -\frac{7}{5}(x - 6)$$

Sep 26-7:48 AM

Find the slope of each line.

32. $5x + y = 4$

$$m = -5$$

$$-\frac{5}{1}$$

33. $-3x + 2y = 7$

$$m = \frac{3}{2}$$

34. $-\frac{1}{2}x - y = \frac{3}{4}$

$$m = -\frac{1}{2}$$

Sep 26-7:49 AM

35. $Ax + By = C$

$$m = -\frac{A}{B}$$

36. $Ax - By = C$

$$m = \frac{A}{B}$$

37. $y = 7$

$$m = 0$$

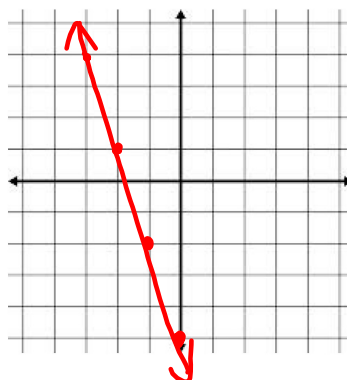
Sep 26-7:49 AM

Write an equation for each line. Then graph the line.

38. through $(-2, 1)$ and parallel to $y = -3x + 1$

$$m = -3$$

$$\begin{aligned} y - 1 &= -3(x + 2) \\ y - 1 &= -3x - 6 \\ y &= -3x - 5 \end{aligned}$$



Sep 26-7:49 AM

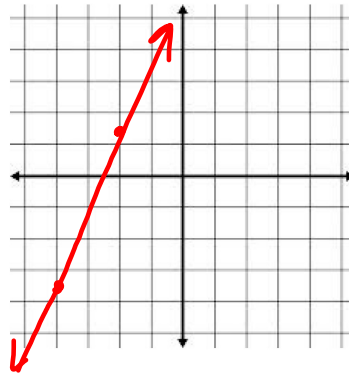
39. through $(-3, -1)$ and perpendicular to $y = -\frac{2}{5}x - 4$

$$m = \frac{5}{2}$$

$$y + 1 = \frac{5}{2}(x + 3)$$

$$y + 1 = \frac{5}{2}x + \frac{15}{2}$$

$$y = \frac{5}{2}x + \frac{13}{2}$$



Sep 26-7:49 AM

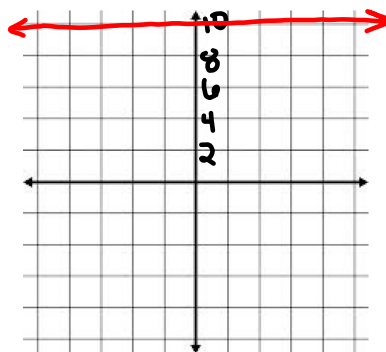
40. through $(-7, 10)$ and horizontal

$$m = 0$$

$$y - 10 = 0(x - 7)$$

$$y - 10 = 0$$

$$y = 10$$

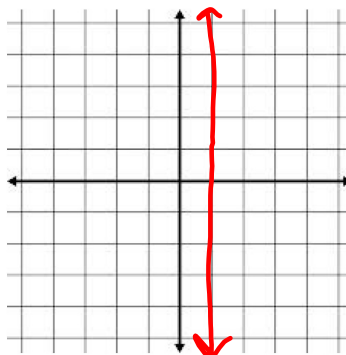


Sep 26-7:49 AM

41. through $(1, -\frac{2}{7})$ and vertical

$m = \text{undefined}$

$x = 1$



Sep 26-7:49 AM

For each function, determine whether y varies directly with x . If so, find the constant of variation and write the equation.

1.

x	y
2	4
4	8
16	32

D.V
 $K = 2$
 $y = 2x$

2.

x	y
2	-6
4	-12
5	-15

D.V
 $K = -3$
 $y = -3x$

3.

x	y
11	22
16	32
7	42

NO

4.

x	y
27	9
30	10
60	20

D.V
 $K = \frac{1}{3}$
 $y = \frac{1}{3}x$

Sep 26-8:06 AM

5.

x	y
2	14
3	21
5	35

D. V.
 $k = 7$
 $y = 7x$

6.

x	y
3	9
4	13
7	23

NO

7.

x	y
-2	4
-3	6
-5	10

D. V
 $k = -2$
 $y = -2x$

8.

x	y
1	-2
3	-8
5	14

NO

Sep 26-8:07 AM

Determine whether y varies directly with x . If so, find the constant of variation.

9. $y = 12x$

$k = 12$

10. $y = 6x$

$k = 6$

11. $y = -2x$

$k = -2$

12. $y = 4x + 1$

NO

Sep 26-8:07 AM

13. $y = 4x - 3$

NO

14. $y = -5x$

$K = -5$

15. $y - 6x = 0$

$K = 6$

16. $y + 3 = -3x$

NO

Sep 26-8:07 AM

For each direct variation, find the constant of variation. Then find the value of y when $x = -5$.

17. $y = 2$ when $x = 7$ $K = \frac{2}{7}$ $y = -\frac{10}{7}$

18. $y = -5$ when $x = 3$ $K = -\frac{5}{3}$ $y = \frac{25}{3}$

19. $y = -2$ when $x = 2$ $K = -1$ $y = 5$

20. $y = -\frac{2}{3}$ when $x = -\frac{1}{3}$ $K = 2$ $y = 10$

21. $y = 17$ when $x = -4$ $K = -\frac{17}{4}$ $y = -\frac{85}{4}$

22. $y = \frac{1}{2}$ when $x = -2$ $K = -\frac{1}{4}$ $y = \frac{5}{4}$

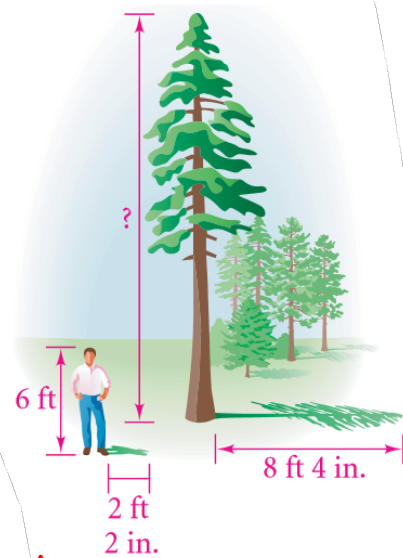
$$y = \frac{2}{7}x$$

$$y = \frac{2}{7}(-5) = -\frac{10}{7}$$

Sep 26-8:07 AM

23. **Environment** Suppose you work on a tree farm and you need to find the height of each tree. You know that the length of an object's shadow varies directly with its height. Refer to the diagram.

- Find the constant of variation.
- Write an equation to calculate the height of the tree.
- Find the height of a tree with a shadow 8 ft 4 in. long.



$$k = \frac{26}{72} = \frac{13}{36}$$

$$S = \frac{13}{36} h$$

$$S = 100 \text{ in}$$

$$100 = \frac{13}{36} h$$

$$100 \left(\frac{36}{13} \right) = h = \frac{3600}{13} = 277 \text{ in} = 23' 9"$$

Sep 26-8:07 AM

For Exercises 24–27, y varies directly with x .

24. If $y = 4$ when $x = -2$, find x when $y = 6$. $x = -3$

25. If $y = 6$ when $x = 2$, find x when $y = 12$. $x = 4$

26. If $y = 7$ when $x = 2$, find y when $x = 3$. $y = 10.5$

27. If $y = 5$ when $x = -3$, find y when $x = -1$. $y = \frac{5}{3}$

Sep 26-8:07 AM

28. **Aviation** A speed of 60 mi/h is equal to a speed of 88 ft/s. Find the speed in miles per hour of an aircraft travelling 1000 ft/s.

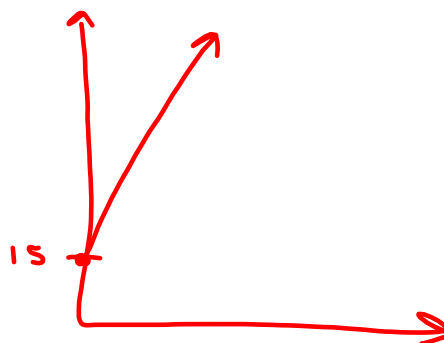
$$\frac{60 \text{ mph}}{88 \text{ ft/sec}} = \frac{? \text{ mph}}{1000 \text{ ft/s}}$$

682 mph
~~700~~

Sep 26-8:08 AM

1. A car enters an interstate highway 15 mi north of a city. The car travels due north at an average speed of 62.5 mi/h. Write an equation to model the car's distance d from the city after traveling for h hours. Graph the equation.

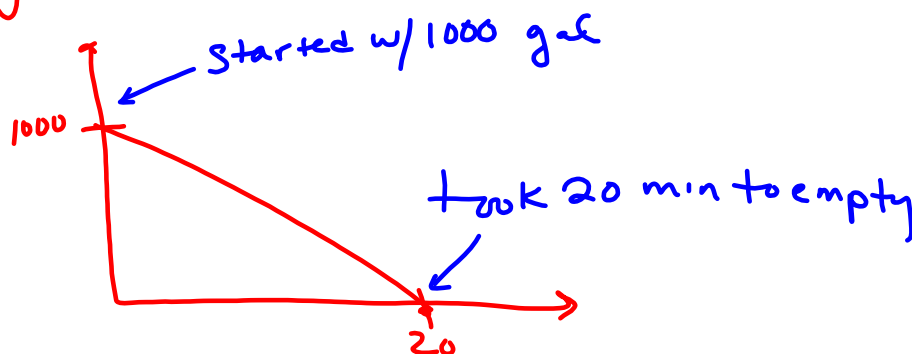
$$d = 62.5h + 15$$



Sep 26-8:08 AM

2. A pump removes 1000 gal of water from a pool at a constant rate of 50 gal/min.
- Write an equation to find the amount of water y in the pool after t minutes.
 - Graph the equation and interpret the t - and y -intercepts.

$$y = 1000 - 50t$$

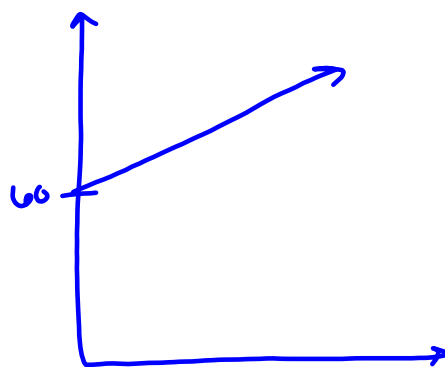


Sep 26-8:08 AM

3. A tree 5 ft tall grows an average of 8 in. each year. Write and graph an equation to model the tree's height h after x years.

$$5\text{ ft} = 60\text{ in}$$

$$h = 60 + 8x$$



Sep 26-8:09 AM

For each situation, find a linear model and use it to make a prediction.

4. There are 2 leaves along 3 in. of an ivy vine. There are 14 leaves along 15 in. of the same vine. How many leaves are there along 6 in. of the vine?

(length, leaves)

(3, 2)

(15, 14)

$$m = \frac{14 - 2}{15 - 3} = 1$$

$$y - 2 = 1(x - 3)$$

$$y - 2 = x - 3$$

$$y = x - 1$$

$$y = 6 - 1 = 5 \text{ leaves}$$

Sep 26-8:09 AM

5. An empty 5-gal water jug weighs 0.75 lb. With 3 c of water inside, the jug weighs 2.25 lb. Predict the weight of the jug with 5 c of water inside.

(cups, weight)

(0, 0.75)

(3, 2.25)

$$m = \frac{2.25 - 0.75}{3 - 0} = \frac{1.5}{3} = 0.5 \text{ or } \frac{1}{2}$$

$$y - 0.75 = \frac{1}{2}(x - 0)$$

$$y - 0.75 = \frac{1}{2}x$$

$$y = \frac{1}{2}x + 0.75$$

$$y = \frac{1}{2}(5) + 0.75 = 3.25 \text{ lb}$$

Sep 26-8:09 AM

6. There are 55 blades of grass in 1 in.² of lawn. There are 230 blades of grass in 4 in.² of the same lawn. How many blades of grass are in 3 in.² of lawn?

(area, blade)

(1, 55)

(4, 230)

$$m = \frac{230 - 55}{4 - 1} = \frac{175}{3}$$

$$y - 55 = \frac{175}{3}(x - 1)$$

$$y - 55 = \frac{175}{3}x - \frac{175}{3}$$

$$y = \frac{175}{3}x - \frac{10}{3}$$

$$y = \frac{175}{3}(3) - \frac{10}{3} = 171\frac{2}{3} \approx 172$$

Sep 26-8:09 AM

7. A 2-mi cab ride costs \$5.25. A 5-mi cab ride costs \$10.50. How much does a 3.8-mi cab ride cost?

(distance, Cost)

(2, 5.25)

(5, 10.50)

$$m = \frac{10.50 - 5.25}{5 - 2} = \frac{5.25}{3} = 1.75$$

$$y - 5.25 = 1.75(x - 2)$$

$$y - 5.25 = 1.75x - 3.5$$

$$y = 1.75x + 1.75$$

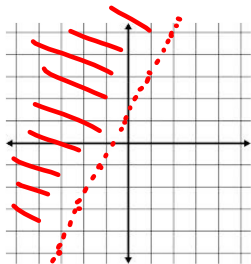
$$y = 1.75(3.8) + 1.75$$

$$y = \$8.40$$

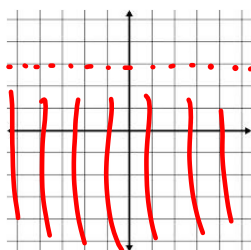
Sep 26-8:09 AM

Graph each inequality.

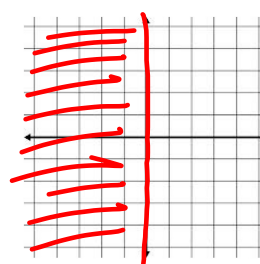
1. $y > 2x + 1$



2. $y < 3$

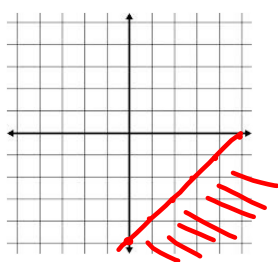


3. $x \leq 0$

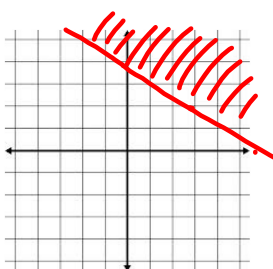


Sep 26-8:10 AM

4. $y \leq x - 5$

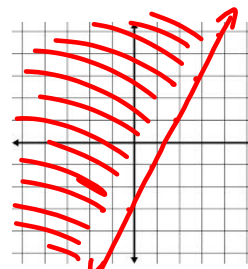


5. $2x + 3y \geq 12$



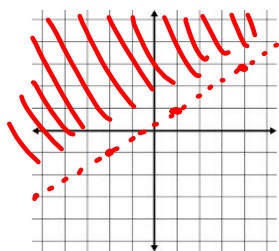
6. $2y \geq 4x - 6$

$y \geq 2x - 3$

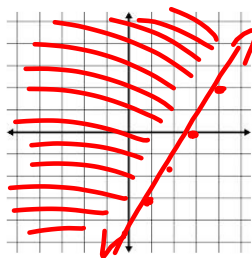


Sep 26-8:10 AM

7. $y > \frac{2}{3}x + \frac{1}{3}$

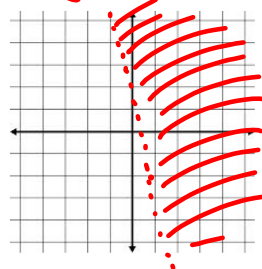


8. $3x - 2y \leq 9$



9. $5x > -y + 3$

$$y > -5x + 3$$



Sep 26-8:10 AM

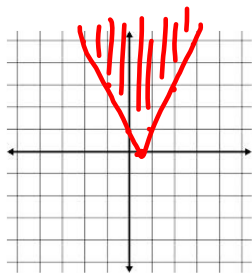
10. **Cooking** The time needed to roast a chicken depends on its weight. Allow at least 20 min/lb for a chicken weighing up to 6 lb. Allow at least 15 min/lb for a chicken weighing more than 6 lb.

- Write two inequalities to represent the time needed to roast a chicken.
- Graph the inequalities.

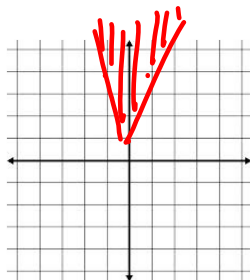
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Graph each absolute value inequality.

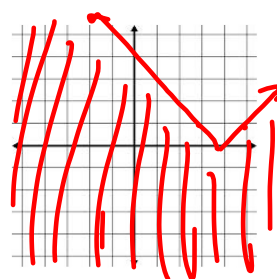
11. $y \geq |2x - 1|$



12. $y \leq |3x| + 1$

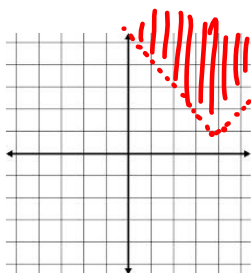


13. $y \leq |4 - x|$



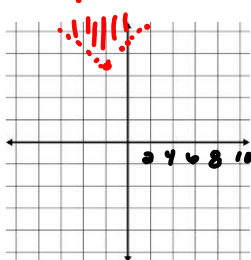
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14. $y > |-x + 4| + 1$



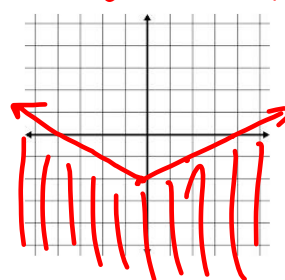
15. $y - 7 > |x + 2|$

$y > |x + 2| + 7$



16. $y + 2 \leq \left|\frac{1}{2}x\right|$

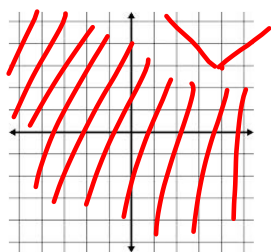
$y \leq \left|\frac{1}{2}x\right| - 2$



Sep 26-8:10 AM

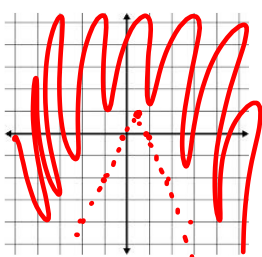
17. $3 - y \geq -|x - 4|$

$y \leq |x - 4| + 3$



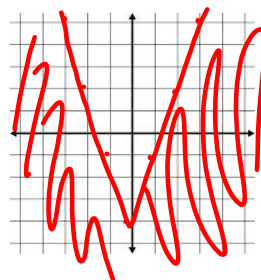
18. $1 - y < |2x - 1|$

$y > |2x - 1| + 1$



19. $y + 3 \leq |3x| - 1$

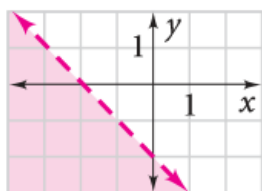
$y \leq |3x| - 4$



Sep 26-8:10 AM

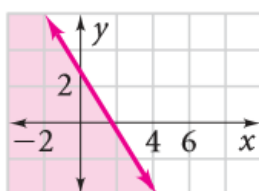
Write an inequality for each graph. In each case, the equation for the boundary line is given.

20. $y = -x - 2$



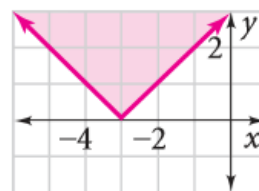
$y < -x - 2$

21. $5x + 3y = 9$



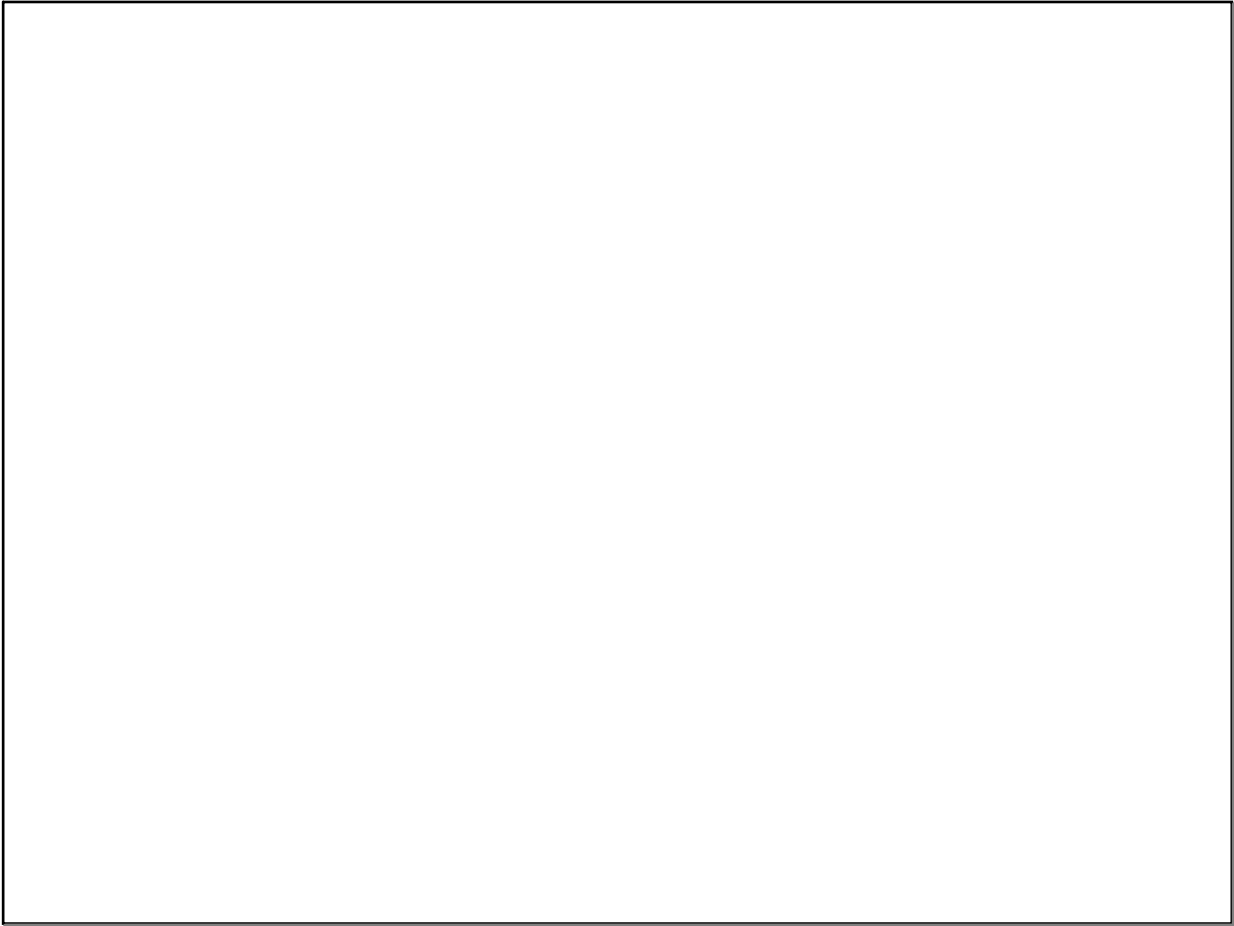
$5x + 3y \leq 9$

22. $2y = |2x + 6|$



$2y \geq |2x + 6|$

Sep 26-8:11 AM



Sep 27-8:44 AM